

NASA TECH BRIEF

Lewis Research Center



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Fail-Safe Fire Detection System

The Problem:

A modern commercial fire detection system used to monitor an aircraft engine lacked one important, and a second desirable, feature. First, the system provided only a manual test of system integrity, by depressing a push button. Accidental damage during engine operation could make parts of the system inoperative, which would not be known until the next manual test. Second, the system did not include an integral visual or audible alarm to signal either a fire or a malfunction.

The Solution:

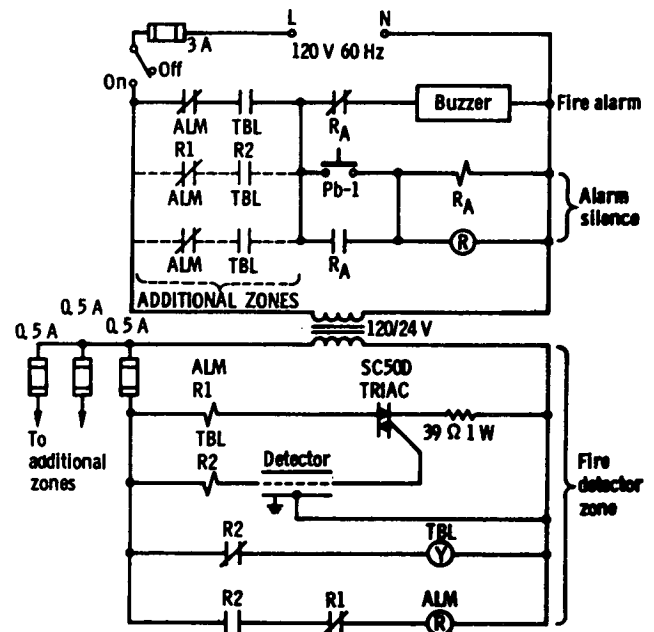
A fire detection control system that continually monitors its own integrity and automatically signals any malfunction, and that separately signals a fire in any zone being monitored.,

How It's Done:

The system is shown schematically in the figure. When the system is "on," the triac is biased into conduction through relay R2 and the detector. This bias current energizes relay R2 and, with the triac conducting, R1 is also energized. Therefore, under normal operation, both relays R1 and R2 are energized and the triac is conducting, thus providing a fail-safe mode of operation.

If the detector circuit should open due to accidental damage (wire or connection failure due to vibration, etc.), relay R2 would be de-energized thus activating a yellow trouble light and locking out the alarm signal for that particular zone. This assures the monitoring of the detector circuit at all times.

If any zone should go into an alarm condition due to a fire, the electrical resistance of the inorganic salt around the center conductor is reduced by the rising temperature and the center conductor of the detector is essentially grounded to the case. At temperatures less than 339 K (150°F), the resistance between the center conductor and the outer shell is greater than 1 megohm. When heated, the inorganic salts become a conductor of very low resistance at specific alarm temperatures for which they are designed; e.g., 575 K, 680 K, 755 K, etc. (575°, 765°, 900°F, etc.). When this occurs, the gate of the triac is essentially grounded and the triac is turned off. Relay R1 is de-energized and an alarm signal is given.



Notes:

1. This innovation should be of interest in the fields of chemical and petroleum processing, power generation, equipment testing, and building protection.
2. No additional documentation is available. Specific technical questions, however, may be directed to:

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Patent Status:

NASA has decided not to apply for a patent.

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(LEW-12238)

Category 02